

**Design and Operation of a Frequency Doubled Nd:YAG Thomson Scattering System with Transmission Grating ICCD Spectrometer<sup>1</sup>**

N.L. SCHOENBECK, A.S. DOWD, R.J. FONCK, D.J. SCHLOSSBERG, G.R. WINZ, University of Wisconsin-Madison — A novel Thomson scattering system has been deployed on the Pegasus Toroidal Experiment. It provides a relatively low-cost, simplified design. Scattering is achieved using a 7 ns, 2 J frequency doubled Nd:YAG laser operating at 532 nm. The laser focuses to  $\sim 3$  mm diameter within the plasma via a 7 m beam-line. The beam-line contains cameras as beam finders and remotely adjustable mirrors for shot-to-shot alignment. A custom multi-element lens collects scattered photons from  $15 \text{ cm} < R_{maj} < 85 \text{ cm}$  with 1.2 cm radial resolution. Eight fiber optic bundles provide 8 spatial points for sampling the laser or background light. Each set of 8 channels is measured in a single spectrometer that utilizes a high efficiency ( $\sim 80\%$ ) volume phase holographic grating and a high quantum efficiency ( $> 40\%$ ) image intensified CCD (ICCD) camera. Three spectrometers provide a total of 24 channels. Two interchangeable gratings exist to cover low ( $T_e = 10\text{--}100 \text{ eV}$ ) and high ( $T_e = 0.10\text{--}1 \text{ keV}$ ) electron temperature regimes on Pegasus. The spectrometer is optimized for  $n_e$  from mid- $10^{18}$  to mid- $10^{19} \text{ m}^{-3}$ . The signal-to-noise expected is  $\sim 0.5$  of an equivalent system using Nd:YAG at 1064 nm and avalanche photodiode detectors.

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- Prefer Oral Session  
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